

HIGH VOLTAGE FAST-SWITCHING NPN POWER TRANSISTOR

- STMicroelectronics PREFERRED SALES TYPE
- NPN TRANSISTOR
- HIGH VOLTAGE CAPABILITY
- VERY HIGH SWITCHING SPEED
- FULLY CHARACTERISEZ AT 125 °C
- LOW SPREAD OF DYNAMIC PARAMETERS

APPLICATIONS

- ELECTRONIC BALLAST FOR FLUORESCENT LIGHTING
- SWITCH MODE POWER SUPPLIES

DESCRIPTION

The device is manufactured using high voltage Multi-Epitaxial Mesa technology for cost-effective high performance. It uses a Hollow Emitter structure to enhance switching speeds.

The BUL series is designed for use in lighting applications and low cost switch-mode power supplies.

Figure 1: Package

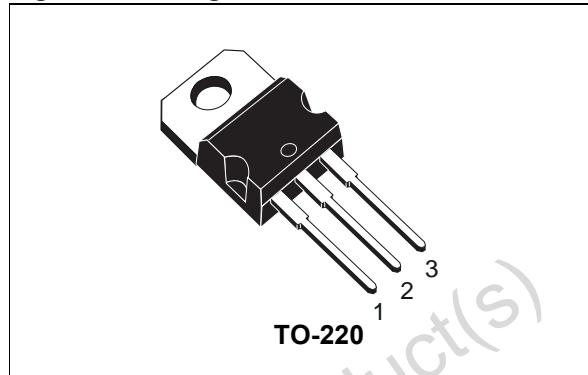


Figure 2: Internal Schematic Diagram

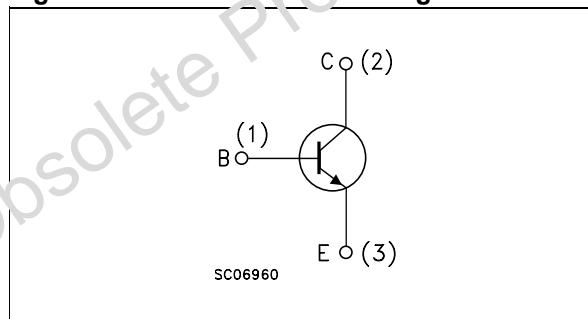


Table 1: Order Codes

Part Number	Marking	Package	Packaging
BUL416	BUL416A or (#) BUL416B	TO-220	Tube

See:note on page 2

Table 2: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage ($V_{BE} = 0$)	1600	V
V_{CEO}	Collector-Emitter Voltage ($I_B = 0$)	800	V
V_{EBO}	Emitter-Base Voltage ($I_C = 0$)	9	V
I_C	Collector Current	6	A
I_{CM}	Collector Peak Current ($t_p < 5\text{ms}$)	9	A
I_B	Base Current	5	A
I_{BM}	Base Peak Current ($t_p < 5\text{ms}$)	8	A
P_{tot}	Total Dissipation at $T_C = 25^\circ\text{C}$	110	W
T_{stg}	Storage Temperature	-65 to 150	°C

Symbol	Parameter	Value	Unit
T_J	Max. Operating Junction Temperature	150	°C

Table 3: Thermal Data

$R_{thj-case}$	Thermal Resistance Junction-Case	Max	1.14	$^{\circ}\text{C/W}$
$R_{thj-amb}$	Thermal Resistance Junction-Ambient	Max	62.5	$^{\circ}\text{C/W}$

Table 4: Electrical Characteristics ($T_{case} = 25^{\circ}\text{C}$ unless otherwise specified)

Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
I_{CES}	Collector Cut-off Current ($V_{BE} = 0$ V)	$V_{CE} = 1600$ V				100	μA
		$V_{CE} = 1600$ V	$T_J = 125^{\circ}\text{C}$			500	μA
I_{CEO}	Collector Cut-off Current ($I_B = 0$)	$V_{CE} = 800$ V				250	μA
$V_{CEO(sus)}^*$	Collector-Emitter Sustaining Voltage ($I_B = 0$)	$I_C = 100$ mA	$L = 25$ mH	800			V
V_{EBO}	Emitter-Base Voltage ($I_C = 0$)	$I_E = 10$ mA		9			V
$V_{CE(sat)}^*$	Collector-Emitter Saturation Voltage	$I_C = 2$ A	$I_B = 0.4$ A			1.5	V
		$I_C = 4$ A	$I_B = 1.33$ A			3	V
$V_{BE(sat)}^*$	Base-Emitter Saturation Voltage	$I_C = 2$ A	$I_B = 0.4$ A			1.2	V
		$I_C = 4$ A	$I_B = 1.33$ A			1.5	V
h_{FE}^*	DC Current Gain	$I_C = 10$ mA	$V_{CE} = 5$ V	10			
		$I_C = 0.7$ A	$V_{CE} = 5$ V			27	
		Group A		12			
		Group B		25		40	
t_s t_f	INDUCTIVE LOAD Storage Time	$I_C = 3$ A	$I_{B1} = 1$ A		2.3		μs
	Fall Time	$V_{BE(off)} = -5$ V	$R_{BB} = 0 \Omega$		650		ns
t_s t_f	INDUCTIVE LOAD Storage Time	$V_{clamp} = 200$ V	$L = 200 \mu\text{H}$				
	Fall Time	(see figure 12)					
					3		μs
					680		ns

* Pulsed: Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$.

Note: Product is pre-selected in DC current gain (Group A and Group B). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details.

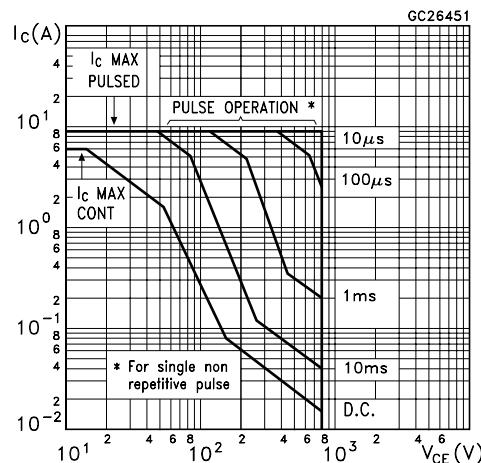
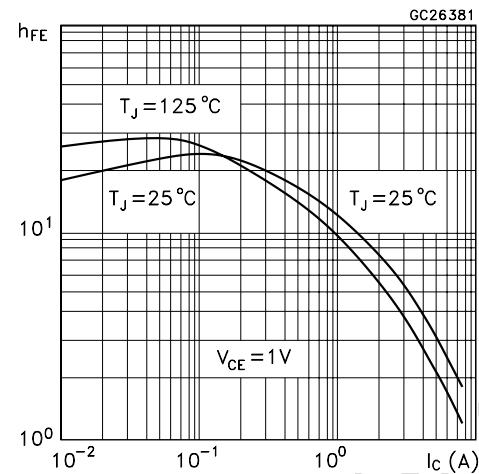
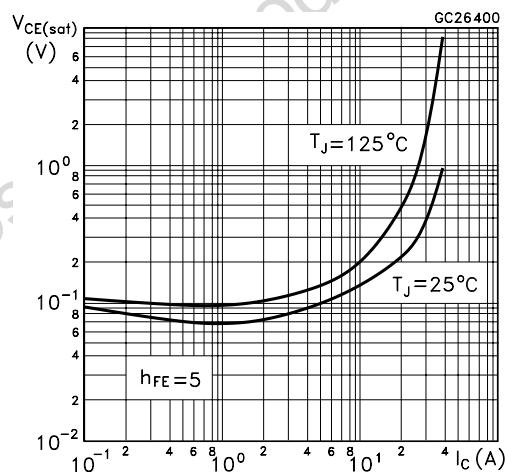
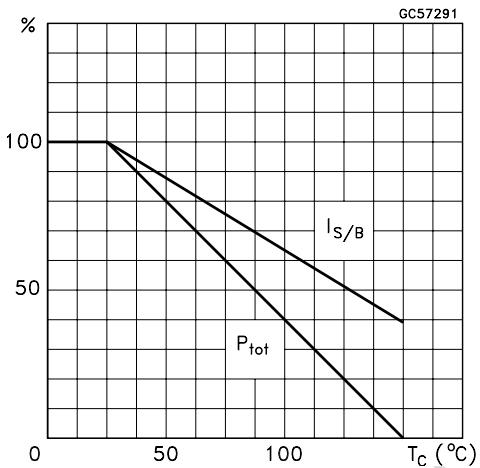
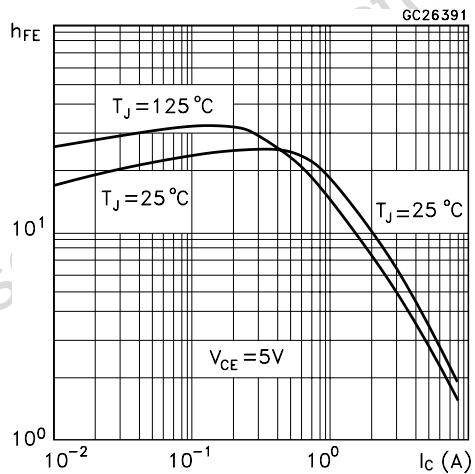
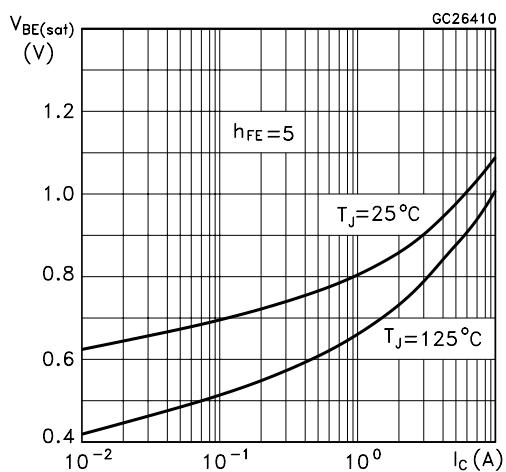
Figure 3: Safe Operating Area**Figure 4: DC Current Gain****Figure 5: Collector-Emitter Saturation Voltage****Figure 6: Derating Curve****Figure 7: DC Current Gain****Figure 8: Base-Emitter Saturation Voltage**

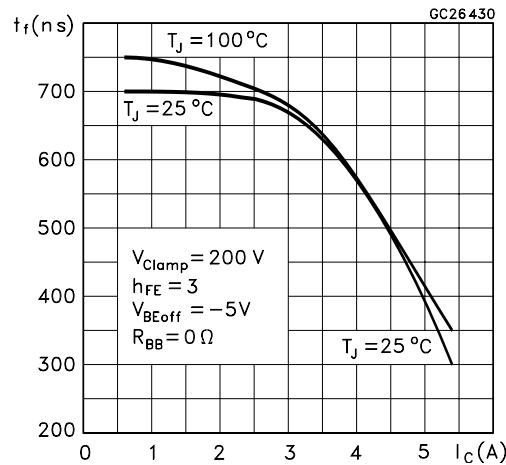
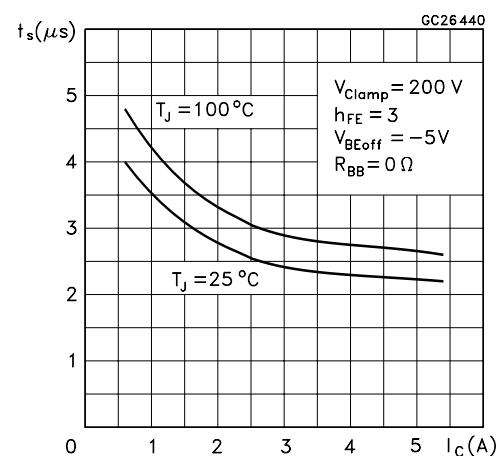
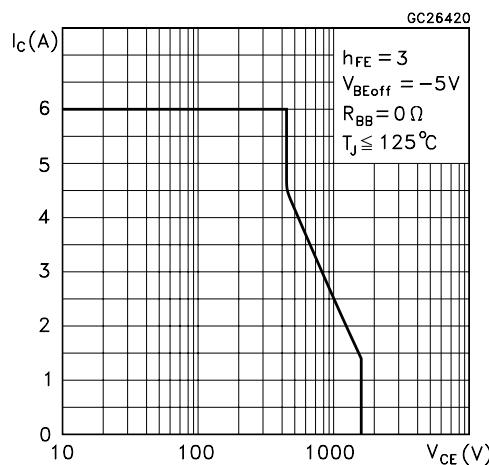
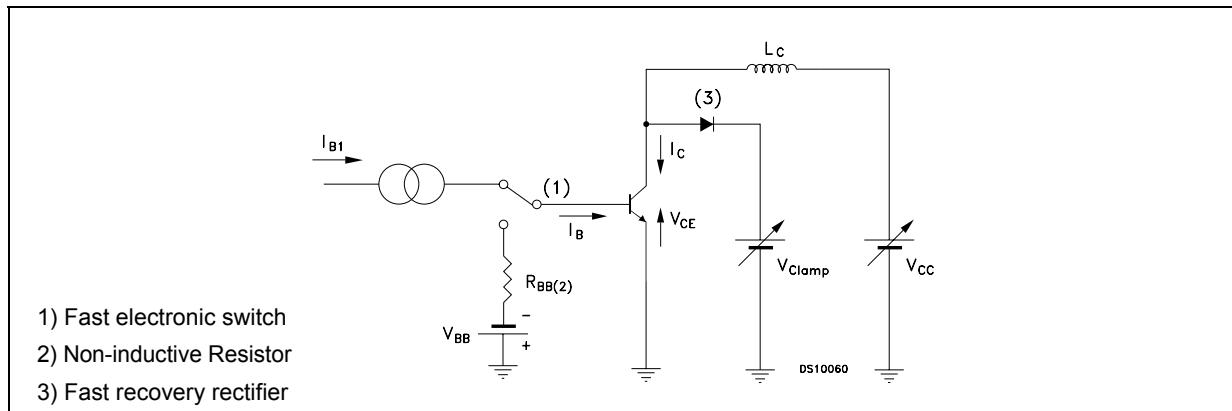
Figure 9: Inductive Load Fall Time**Figure 11: Resistive Load Stoarage Time****Figure 10: Reverse Biased SOA**

Figure 12: Inductive Load Switching Test Circuit

Obsolete Product(s) - Obsolete Product(s)

TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	Typ	MAX.	MIN.	Typ.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
ϕP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116

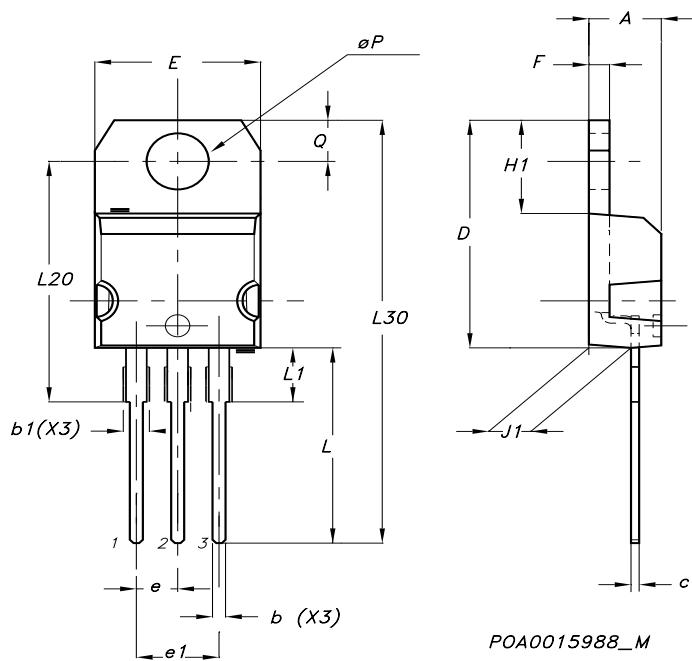


Table 5:

Version	Release Date	Change Designator
14-Jan-2004	1	First Release.
09-Sep-2004	2	Second Release.
26-Jan-2005	3	Third Release.

Obsolete Product(s) - Obsolete Product(s)

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